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GOMPHUS DILATATUS, VASTUS AND A NEW SPECIES, LINEATIFRONS

(ODONATA)

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(With Plates XIV and XV)

Abstract

This paper points out that two species have been confused under the name of *Gomphus dilatatus*: the true *dilatatus* of Rambur, known only from Georgia and Florida, and a form in the northern states for which the name *lineatifrons* is proposed. The differentials are listed and many of them figured. *G. vastus* Walsh is the northern representative of *dilatatus* Rambur and its characters are briefly enumerated. A comparison of the existing data on the larvae of the three forms is given.

In the summer of 1917, the late V. A. E. Daecke gave me two females of a large *Gomphus* which he had taken at Weaver, Pennsylvania, a short time before. They were, apparently, of the species referred to in recent literature as *Gomphus dilatatus* Rambur. As this species had not been recorded from Pennsylvania, if indeed from as far east, I studied them rather minutely. It soon became apparent that they differed in a number of details from the descriptions of the type of the species, wherefore I was led to a more extended study. Specimens from Florida most closely approached the original of Rambur. The evidence at hand seemed to point to the existence of a typical southern form and an atypical northern form. Later in the summer of 1917, at the Museum of Comparative Zoology, I studied such material as that rich institution possessed. Mr. E. B. Williamson, with his usual liberality, placed his *dilatati* at my convenience. Prof. J. G. Needham lent me two males, one female and some larval exuviae from Georgia and Florida. Prof. C. B. Wilson, of Westfield, Massachusetts, put a female from Tennessee at my disposition. Mr. Nathan Banks supplied additional information on the specimens in the Museum at Cambridge, and, with the return of peace, M. G. Severin, of the

Musée Royal d'Histoire Naturelle, at Brussels, has furnished both notes on and drawings from Rambur's type of *dilatatus* now in that collection. Few specimens from the Southern States appear to exist in collections. Mr. R. P. Currie wrote in March, 1919, that there were none in the United States National Museum; a "want" notice in the exchange page of the "Entomological News" from February to July, 1919, brought forth only a single specimen, which came from that untiring helper, Mr. W. T. Davis. To all these friends I return hearty thanks for their assistance.

Perhaps this paper will attract the attention of collectors in the South to the desirability of further knowledge of this species—our largest representative of the genus *Gomphus*.

On account of the differences set forth below I propose to regard the northern form as a distinct species under the name of

Gomphus lineatifrons new species.

Black on most parts of the body less extended than in the typical southern *dilatatus*. The differences which I have found are as follows:

Both Sexes

1. Hind margin of the occiput (when the head is viewed from in front so that the top of the frons and the tip of the vertex coincide): in *dilatatus* not projecting, or but slightly projecting, above a line drawn from the top of one eye to the top of the other eye; in *lineatifrons* distinctly projecting above the eye to eye line. (See also no. 20 below.)

2. Black on the suture between frons and nasus (post clypeus): in *dilatatus* a stripe or band 1.11 to 1.4 mm. wide and covering half the height of the frons and half the height of the nasus; in *lineatifrons*, a line or a narrow stripe .44 mm. wide at most (Livingston ♂).

3. Rhinarium (ante-clypeus): in *dilatatus* black (or in part pale green, Thaxter's ♂), this black continued transversely on to each side of the nasus where it encloses the rhinarium; in *lineatifrons* pale green except for a little blackish at the extreme infero-lateral angles, no black on the enclosing sides of the nasus.

4. Labrum in both forms with two transverse marginal black stripes, one at the base, the other at the apex; pale green area between these black stripes occupies: in *dilatatus* one-third to one-half (♂), three-fifths to two-thirds (♀), of the total height of the sclerite; in *lineatifrons* from .64 to .71 of the same height. In specimens of both forms there may be present an isolated central brownish or blackish spot in the midst of the green, or a prolongation in the median line from the basal black stripe toward, or to, the apical stripe.

5. Hind prothoracic lobe black: in *dilatatus* with no pale spot; in *lineatifrons* with a single or double, median, greenish spot.

6. Lateral margins of the dark brown mid-dorsal thoracic stripe: in *dilatatus* (Plate XIV, fig. 13) diverging strongly cephalad (from 1.5 to 1.63 mm. ♂, 1.7 to 2.22 mm. ♀, posteriorly to 2.96 to 3.11 mm. ♂, 3.33 mm. ♀, anteriorly)¹; in *lineatifrons* (Plate XIV, fig. 11) subparallel or but slightly diverging cephalad (from 1.18 to 1.92 mm. ♂, 1.7 to 1.85 mm. ♀, posteriorly to 1.70 to 2.0 mm. ♂, 2.07 to 2.15 mm. ♀, anteriorly).

7. Width of the first pale green antehumeral stripe compared to the width of the adjoining half of the dark brown mid-dorsal stripe at mid-height: in *dilatatus* two-thirds to subequal (♂), .67 (♀); in *lineatifrons* 1.18-2. (♂), 1.2 (♀).

8. Width of the second pale green antehumeral stripe compared to the width of the dark brown stripe immediately preceding it at mid-height: in *dilatatus* .5-.67 (♂), .4-.625 (♀), and not interrupted; in *lineatifrons* .2-.33 and more often interrupted near its upper end, or obliterated in its upper third or fourth by fusion of the brown antehumeral and humeral stripes (♂), .15-.22 and not interrupted (except in one Weaver ♀ and on the left side only of the Jellico ♀).

9. Black stripe on the obsolete first lateral thoracic suture: in *dilatatus* not interrupted (except in Thaxter's ♂); in *lineatifrons* distinctly interrupted in its upper half (except in two of the four Tippecanoe ♂♂).

10. Pale markings on the mid-dorsum of abdominal segment seven reaching from the anterior end: in *dilatatus* to three-fifths (♂), four-fifths (♀), of the segment's length, pale green or greenish yellow; in *lineatifrons* to one-half (♂), two-thirds or three-fourths (♀), of the segment's length, bright yellow in both sexes (except in one Weaver ♀, in which they are greenish yellow, and pale green in the Jellico ♀).

11. Expanded lateral margins of abdominal segment eight: in *dilatatus* more convex, in *lineatifrons* less convex (cf. Plate XV, figs. 1, 2).

12. Antenodals on the front wings: in *dilatatus* 12 to 15, 13 most frequent (4 ♂, 2 ♀); in *lineatifrons* 13 to 19, 16 and 14 most frequent (8 ♂ 5 ♀).²

13. Antenodals on the hind wings: in *dilatatus* 9 to 10, equally frequent (4 ♂ 2 ♀); in *lineatifrons* 9 to 13, 10 most frequent (8 ♂ 5 ♀).

14. Size: *dilatatus*, abdomen ♂, 46 to 52, average of four 49.5; ♀, 47 to 52, average of two (Rambur's type, *teste* Selys, and Spring Creek ♀) 49.5; hind wing ♂, 34 to 40, average 37.75; ♀, 40 to 43, average 41.5 mm.; *lineatifrons*, abdomen ♂, 46 to 50, average of eight 48.5; ♀, 46 to 52, average of five 48.6; hind wing ♂, 39 to 41, average 39.6; ♀, 40 to 45, average 42.5 mm.

¹ Of *dilatatus* only the males from Mrs. Slosson and from Johnson's Island and the two females were measured, but no striking difference therefrom was noted in the two males in the Museum of Comparative Zoology. All of the eight males and two females of *lineatifrons* not in the Museum of Comparative Zoology were measured. All these measurements are by eyepiece micrometer in a Zeiss binocular, oc. 4, obj. F. 55.

² In the Minnesota male of *lineatifrons* the discoidal triangle of both front wings is two-celled; in all the other material which I have examined, of both northern and southern forms, this triangle is free. Kellicott mentions one male [of *lineatifrons*] "in which the triangles are all one crossed" (Odon. Ohio, p. 57).

Males

15. Lateral labial lobes: in *dilatatus* chiefly brown; in *lineatifrons* chiefly greenish.

16. Superior abdominal appendages in dorsal view: in *dilatatus* angulate on the lateral margin at .55 to .67 of their length corresponding to the infero-lateral tooth; in *lineatifrons* rounded off at the same place; in profile view the appendages are more robust and the tooth placed a little more distad in *lineatifrons* (cf. figs. 14-16, 18, Plate XV).

17. Genital hamules: in *dilatatus* less robust; in *lineatifrons* more robust (cf. Plate XV, figs. 17 and 20).

18. Posterior margin of the vesicle of the penis when fully extended and in profile view: in *dilatatus* 1.33 mm. in height; or .36 as high as the hind margin of abdominal segment two; in *lineatifrons* 1.7 mm. in height or .48 as high as the hind margin of segment two (only one male of each form has been measured in extended condition, however. Cf. Plate XV, figs. 21, 22.)

Females

19. Vulvar lamina: in *dilatatus* reaching to .47 (drawing of the ♀ type) or .37 (Spring Creek ♀) of the length of the sternite of nine, narrowed distad so that at two-thirds' length it is but half as wide as at base, distal fifth bifid, the divisions acuminate, more acute in the two females I have examined than in the drawing from Rambur's type; in *lineatifrons* reaching to .51 to .55 of the length of the sternite of nine, narrowed to two-thirds its basal width at one-third of its length, thence widened so that at two-thirds' length it is almost as wide as at base, distal fourth bilobed, each lobe broadly rounded (compare Plate XIV, figs. 8-10), or even truncated at tip in the Jellico ♀.

20. Hind margin of the occiput, viewed from in front but also from a more superior or dorsal position than that indicated under no. 1 above: in *dilatatus* almost straight and entire, in *lineatifrons* widely and shallowly excavated in the middle, a convexity on each side of the median excavation (cf. figs. 3, 5, Plate XIV). (Males of both forms have the hind margin distinctly convex, although with the difference mentioned under no. 1 above).

The references in the literature to these two forms and the material which I have studied are as follows:

Gomphus dilatatus

1842. Rambur, Hist. Nat. Ins. Névr., p. 155. [♀ "l'Amerique septentrionale".]

1854. Selys, Bull. Acad. Roy. Belg., xxi, pt. II, p. 47 (Synop. Gomph. p. 28). [♂ ♀ "États-Unis".]

1858. Selys & Hagen, Monog. Gomph., p. 123, pl. 7, figs. 3 a-m. [Details of both sexes figured. "Les États-Unis, d'après le type femelle décrit par M. Rambur, qui fait partie de ma collection, et un mâle appartenant à M. Hagen."]

1861. Hagen, Syn. Neur. N. Amer., p. 103. [♂ ♀ "Georgia (Abbot)."]

1863. Hagen, Stet. Ent. Zeit. xxiv, p. 373. ["Type in Escher's Sammlung. Abbildung 14. Männchen: 24. Mai, not very common." Georgia, Abbot.]
1874. Hagen, Proc. Bost. Soc. Nat. Hist. xvi, p. 359. ["Male No. 14. Brit. Mus. May 24. Not very common. I possess a male type from Abbot." Georgia.]
1875. Hagen, Proc. Bost. Soc. Nat. Hist. xviii, p. 46. ["♂ ♀ Georgia, May 24; Florida; Lansing, Mich." All this reference belongs here except the locality Lansing, Mich.]
- Aeshna dilatata*. 1890. Kirby, Cat. Odon., p. 66. ["S. States, Michigan." All of this reference except "Michigan" belongs here.]
- Gomphus dilatatus*. 1893. Slosson, Journ. N. Y. Ent. Soc. i, p. 150. [Suwanee Springs, Florida.]
1903. Needham, Proc. U. S. Nat. Mus. xxvi, pl. xxxiii, fig. 1 [♂ venation.]
1910. Muttkowski, Cat. Odon. N. Amer. (Bull. Publ. Mus. Milwaukee, I, 1), p. 91. ["Ga. to N. Y. & Mich., Ill." In part only.]

Material studied: ♂ Florida (probably Suwanee Springs), Mrs. A. T. Slosson, in the writer's collection at The Academy of Natural Sciences of Philadelphia.

♂ with label "*Gomphus dilatatus* Rbr. ♂" in Hagen's handwriting and the printed label "Hagen" (no locality label); ♂ with label "Florida Thaxter" in Hagen's handwriting; both in the Museum of Comparative Zoology, Cambridge, Massachusetts.

♂ ♀ Johnson Island, Osceola County, Florida, A[dolph] H[empel], ♂ March 23, 1897, ♀ March 28, 1897. ♀ Spring Creek, Decatur County, Georgia, June 7 to 23, 1911, J. C. Bradley. These three in the Cornell University collection. The Johnson Island ♀ has the abdomen incomplete and the hind wings not fully expanded.

Comment on the literature and material

Rambur in his original description (1842) says: "Je ne connais que la femelle . . . Un peu plus de huit centim. d'envergure et de sept de long . . . Abdomen . . avec une ligne jaune en dessus, qui s'arrête avant le huitième, . . . dilatée sur le huitième."

There would seem to be a contradiction here as regards the yellow line on the dorsum of segment eight. DeSelys and Hagen in 1858, as noted above, had only one male and one female before them. The female was Rambur's type, whose dimensions are given as "Aile supérieure 42, aile inférieure 40, Longueur totale 65 mm." Their description of the female is brief and comparative with that of the male; no difference in the markings of the abdomen from those of the male are mentioned; the latter is said to have "une bande dorsale maculaire (jaune) sur les sept

premiers segments," with no mention of any dorsal pale marking on segment eight. Their testimony is of about the year 1855. M. Severin writes of this type in 1921 as having "8me segment sans ligne claire median." Of the material which I have studied only the male from Mrs. Slosson has any pale dorsal spot on segment eight—a small green (?) spot at the mid-base. The *Monographie* (1858) says of the female's abdomen: "le 10e offre une carène dorsale," which is not found on any female of either of these two forms which I have seen. On this point M. Severin writes of the type: "10me segment cassé mais je crois sans carène."

It would seem reasonable to identify the male cited above as in the Museum Comparative Zoology without locality label, as that quoted in the literature of 1858, 1861, 1863 and 1874, in which case its provenance would be Georgia. It agrees with the description of 1858, and it may have been collected in Scriven County, according to the data concerning Abbot brought together by Scudder.³ "Thaxter," on the label of the other M. C. Z. male, is, doubtless, the collector's name, Prof. Roland Thaxter, of Cambridge. Prof. Needham writes me that his figure of the venation (1903) was made from the male from Johnson Island, Florida.

Gomphus lineatifrons new species

Gomphus dilatatus. 1875. Hagen, Proc. Bost. Soc. Nat. Hist., xvii, p. 46. [The Lansing, Mich., locality only.]

Aeshna dilatata. 1890. Kirby, Cat. Odon., p. 66. [Only the Michigan locality.]

Gomphus dilatatus. 1896. Kellicott, Journ. Cincinnati Soc. Nat. Hist., xviii, p. 106. [♂, South Columbus, Ohio.]

1899. Kellicott, Odon. Ohio, pp. 55, 56. [Central Ohio.]

1900. Williamson, 24th Ann. Rept. Dept. Geol. Indiana, pp. 285, 286, pl. vi, f. 6 [♂ apps]. [In part.]

1901. Williamson, Proc. Indiana Acad. Sci., pp. 120, 123. [Tippecanoe River, near Warsaw, Indiana; Illinois.]

Gomphurus dilatatus. 1903. Needham, Bull. 68, N. Y. St. Mus., p. 265, fig. 14. [Labium of nymph, Elkhart, Indiana.]

Gomphus dilatatus. 1904. Butler, Trans. Amer. Ent. Soc. xxx, p. 126, pl. vi, fig. 1 f. [Ligula of nymph.]

1905. Williamson, Ohio Naturalist, v, p. 310. [Livingston, Kentucky.]

1908. Muttkowski, Bull. Wisconsin Nat. Hist. Soc., vi, p. 83.

³ The Butterflies of the Eastern United States and Canada, Vol. I, pp. 651-2.

1910. Muttkowski, Cat. Odon. N. Amer. (Bull. Publ. Mus. Milwaukee, i, 1), p. 91. [In part. "N. Y., Mich., Ill."]
 1912. Wilson, Proc. U. S. Nat. Mus. Vol. 43, p. 191. ["A single female was taken at Jellico, Tennessee, June 28, on the Clear Fork of the Cumberland."]
 1917. Williamson, Univ. Michigan Mus. Zool., Misc. Publ., no. 2 p. 8. [Crawford and Kosciusko Counties, Indiana.]

Material studied: Type, ♀, Weaver, Perry County, Pennsylvania, June 17, 1917, taken by the late Mr. V. A. E. Daecke, in the writer's collection at The Academy of Natural Sciences of Philadelphia. Twelve *paratypes* as follows: A second female from Weaver, same date, collector & collection. ♂ Minnesota, without further data, same collection.

♀ "Michigan Lansing, Cook"; ♀ "Pennington Gap, Va. 6.22"; both in the Museum of Comparative Zoology, Cambridge, Mass.

4♂ Tippecanoe River, Indiana, 6-23-1901, taken by E. B. Williamson and Holliday; 2 ♂ Creek at Indian Village, Noble County, Indiana, July 4, 1917, by E. B. Williamson; ♂ Livingston, Kentucky, 6-23-04, by the same; all seven in Mr. Williamson's collection.

♀ Jellico, Tennessee, in Prof. C. B. Wilson's collection.

Comments on the literature and material

The descriptions of "dilatatus" referable to this species can usually be identified from some detail of coloration or of structure corresponding to one of the differentials listed above. In Kellcott's description of 1899, "fore tibiae" should be corrected to "fore femora," "apical" in the last two lines on page 55 to "basal" and, in the eighth line from the bottom of the same page, perhaps "widely" might be omitted. Mr. Williamson (1901, p. 123) has corrected "apical" to "basal" in his description (1900, p. 286, next to last line). Dr. Muttkowski's statement (1908, p. 83) for "dilatatus:" "Abdominal segments 8-9 black" does not apply to either the northern or the southern form, unless one understands that this is limited to the dorsal surface only, although "a small but distinct yellow basal spot on the eighth abdominal segment" was noted by Mr. Tough in a male from Illinois (Williamson, 1901, p. 123). I have not found the data on which Dr. Muttkowski's citation (1910) of New York as part of the area inhabited by this species is founded; Prof. Needham's description of the larva (1903), although published in a New York State Bulletin, was based on a specimen from Indiana. The female from Tennessee is that referred to in Prof. Wilson's paper of 1912.

Gomphus vastus Walsh

It will be noticed that *dilatatus* as above defined is very similar to the form known in our literature as *Gomphus vastus* Walsh. De Selys, in redescribing *vastus* in 1869, said of it: "Excessive-ment voisin du *dilatatus*. Il en diffère principalement par la taille moindre,"⁴ remarks which would be far less appropriate, applied to the northern form which has passed as *dilatatus* and which it is now proposed to call *lineatifrons*. Most of the differences which are given above to separate *lineatifrons* from *dilatatus* will also serve to distinguish *lineatifrons* from *vastus*. *Vastus* differs from *dilatatus* as follows (using the same numbers for the differentials as above):

2. Width of the black band on the fronto-nasal suture absolutely less (.6 to .74 mm.) and relatively narrower, occupying less than half the height of the front and less than half the height of the nasus.

10. Pale marking (yellow) on the mid-dorsum of abdominal segment seven smaller, reaching from the anterior end to two-fifths or to one-half of the segment's length.

14. Size smaller: abdomen ♂ 37 to 41, ♀ 35 to 41; hind wing ♂ 29 to 31, ♀ 31 to 34 mm.

20. ♀. Hind margin of the occiput, in antero-superior view, more widely excavated even than in *lineatifrons*, showing no slight convexity between the median emargination and each lateral extremity such as is visible in our figure 3, Plate XIV; in dorsal view bent more "forward in the middle," as Walsh noted in his original description, than in either *dilatatus* or *lineatifrons*.

21. ♂. Tooth of the penis more slender, more acute (cf. Plate XV, figs. 21, 23).

22. ♀. A conical spine on the vertex between each lateral ocellus and the adjoining eye, absent in *dilatatus* and in *lineatifrons* (cf. Plate XIV, figs. 3 to 7).

Among the material of *vastus* which I have examined is a female from Buckingham County, Virginia, June 21, 1919, collected by Mr. Wm. T. Davis and in his collection. Both Mr. Davis and I had, at first, referred it to *dilatatus*, but I now believe that it is *vastus*, as it agrees with the latter in the distinctions just given under numbers 10 and 22. It is larger than any other *vastus* that I have seen or whose dimensions are given in the literature, viz.: abdomen 44, hind wing 35.5 mm.; it is still smaller than the smallest female of *dilatatus*. Its occiput (fig. 6), on the other hand, is nearer to that of *dilatatus* than to that of *vastus*, while its black fronto-nasal band is narrower (.4 mm.) than in either.

All these facts, together with its locality suggest that more material collected between Virginia and Georgia may show *vastus*

⁴ Bull. Acad. Roy. Belg., (2) xxviii, p. 177, or 2des Addit. Syn. Gomph., p. 14.

to occupy the position of a subspecies of *dilatatus* into which it may grade geographically. *Vastus* in the north, from New York and Iowa to Pennsylvania and Tennessee (Muttkowski 1910), therefore, represents *dilatatus* of the south, from Virginia to Florida, while *lineatifrons*, hitherto confused with *dilatatus* and with a range similar to (but not, in present knowledge, identical with) that of *vastus*, is more distinct from the other two forms than they are from each other.

LARVAE

Prof. Needham has also sent me three exuviae from Spring Creek, Decatur County, Georgia, June 7 to 23, 1911, collected by Prof. J. C. Bradley, labeled "*Gomphus dilatatus*?." A comparison of these with Hagen's description⁵ of bred exuviae of *Gomphus vastus*, and with Prof. Needham's description⁶ of a supposed *Gomphurus dilatatus* skin from Indiana, which, from its locality is very probably that of *lineatifrons*, gives the following differences:

Size: *dilatatus* (Georgia), total length, 37 to 40 mm., maximum width of abdomen (segment six) 9 to 10 mm.; *vastus*, length 31 mm.; *lineatifrons*, 38 and 10 mm.

Hairiness: *dilatatus*, hairs on sides of the head, antennae, femora and tibiae; *vastus*, body . . . little hairy"; *lineatifrons*, "but little hairy except on the sides of the head, antennae and tibiae."

Third antennal joint: *dilatatus*, twice as long as one and two (antennae lacking in two of the three exuviae); *vastus*, "twice the length of the two basal"; *lineatifrons*, "thrice as long as the two first segments together."

Median labial lobe: *dilatatus*, distal margin almost straight or slightly convex, with a fringe of closely-set scales; *vastus*, "middle third of front border straight, with longer comb of flat scales"; *lineatifrons*, "median lobe in front with a deep semicircular concavity, the sides of which are thinly fringed with flattened hairs or scales." Figure 14, accompanying Prof. Needham's description, shows the form very clearly.

Mid-dorsal abdominal hooks: *dilatatus*, on segments eight and nine only; *vastus*, "on 8th to 9th, short tubercles," *lineatifrons*, "very rudimentary, on segments 7-9 only."

Abdominal segment ten compared to nine: *dilatatus*, variable, one-third to one-fourth as long mid-dorsally; *vastus*, "one-third of 9th"; *lineatifrons*, (not mentioned).

Lateral spines of abdominal segment nine: *dilatatus*, variable in length relative to segment ten, always longer but in no case twice as long; *vastus*, "as long as 10th"; *lineatifrons*, "twice as long as the tenth."

⁵ Trans. Amer. Ent. Soc. XII, p. 265. 1885.

⁶ Bull. 68, N. York State Mus., p. 266. 1903.

Lateral terminal abdominal appendages [cercoids" of Heymons]: *dilatatus* one-fourth shorter than the dorsal appendage; *vastus*, "one-third shorter"; *lineatifrons*, "one-fourth shorter."

It will be seen that, if the very few exuviae examined for each one of these three species represent normal conditions therein, *dilatatus* and *vastus* are in most respects more nearly alike than either of them is to *lineatifrons*. The chief exceptions are in size and in the relative length of the lateral terminal abdominal appendages. Prof. Needham has, in a letter, called his Indiana exuvia into question, writing:

"The figure of the nymphal labium of this species that I published in New York State Museum Bulletin 68, page 266, I now believe was drawn from an injured specimen but unfortunately I can not now find the specimen. The deep concavity of the median lobe may have been the result of an injury. At any rate, the nymph from Spring Creek, Ga., had a different labium. . . . If the one I figured is normal (and the complete fringe of marginal hairs certainly gives no indication of injury), then I should think there has been some mixing of species under the name *dilatatus*."

Inasmuch as the evidence from both imagos and exuviae set forth in this paper is in agreement and the latter confirm the conclusion drawn above, there seems to be no reason for doubting that the Indiana exuvia is normal. The testimony of additional larvae would, nevertheless, be very welcome.

POSTSCRIPT.—After this paper had been put into type, Mr. Williamson sent me a male and a female *Gomphus* labeled, "Amite River, L[ouisiana], 5.28.99 Ed. Foster. Fragments received in bottle years ago." Of the male there are the head, thorax, abdominal segments one to three, six to ten, the superior (but not the inferior) abdominal appendages, one front wing and both hind wings. The female is complete except for abdominal segments four and five and the vulvar lamina. In the thoracic characters (nos. 5-9) of both sexes, in the male features (15-17) and in the shape of the occiput (1 and 20) these two specimens are *dilatatus*. The face, on the other hand, (nos. 2 and 4) is as in *lineatifrons*, while the rhinarium (no. 3) is intermediate in that it is apparently entirely brown, but there is no brown or black on the enclosing sides of the nasus. The hind wing of the male measures 33, of the female, 36 mm. Antehodals, front wing, ♂ 14, ♀ 15 and 12. Antenodals, hind wing, ♂ ♀, 9.

ERRATA.—Two corrections to papers on Odonata in earlier volumes of these Transactions may be noted here: Vol. XLV, page 378, fifth line from bottom for "1 ♂, 1 ♀" read "2 ♂, 1 ♀". Vol. XLVI, page 326, line fifteen, insert "1 ♂" after "August 1, 1909".

⁷ The exact data for the three Georgia exuviae of *dilatatus* are: mid-dorsal length of ten, .85, .74, .96; lateral margin of ten, 1.11, 1.11, 1.33; lateral spines of nine extend beyond lateral margin of ten by .45, .15, .07; mid-ventral length of ten, 1.26, 1.33, 1.48, respectively. All measurements in millimeters.

EXPLANATION OF PLATES

Plate XIV

All the figures on this plate have been drawn from females only. Excepting figures 10 and 12, they have been made with the aid of a camera lucida and compound microscope, Zeiss compensating ocular 2, objective A with the lower lens removed.

Fig. 1. *Gomphus dilatatus* Rambur. Left lateral margin of abdominal segment eight, supero-lateral view at about 45° with the sagittal plane. $\times 9.6$.

Fig. 2. *Gomphus lineatifrons* new species, corresponding to fig. 1. $\times 9.6$.

Fig. 3. *Gomphus lineatifrons* new species. Supero-anterior view of occiput and vertex; *lo*, lateral ocellus; *tw* transverse vertex ridge, posterior to the ocelli. $\times 11.3$.

Fig. 4. *Gomphus lineatifrons* new species. Transverse vertex ridge and ocelli viewed from behind. $\times 11.3$.

Fig. 5. *Gomphus dilatatus* Rambur. Supero-anterior view of occiput (*oc*) and vertex. $\times 11.3$.

Figs. 6, 7. *Gomphus vastus* Walsh. Buckingham County, Virginia, June 21, 1919. 6, Supero-anterior view of occiput and vertex. 7, Transverse vertex ridge and ocelli viewed from behind. *lo*, lateral ocellus; *mo* median ocellus; *sp* vertex spine, between lateral ocellus and compound eye. $\times 11.3$.

Fig. 8. *Gomphus dilatatus* Rambur. Vulvar lamina. $\times 11.3$.

Fig. 9. *Gomphus lineatifrons* new species. Ventral view of ninth abdominal segment showing the vulvar lamina (*vl*). $\times 11.3$.

Fig. 10. *Gomphus dilatatus* Rambur, corresponding to figure 9. This figure was made from the type specimen in the Brussels Museum by the kindness of M. G. Severin, who writes that it bears these labels: "‘coll. Latreille’, papier blanc, l’écriture d’un inconnu; ‘Amer. sept.’ papier blanc, encre rouge, écrit par inconnu; étiquette en papier doré sans écriture a été placé par Rambur sur tous les insectes de la collection Latreille pour les reconnaître; ‘Gomphus dilatatus R ♀’ papier blanc avec l’écriture de deSelys.” \times about 11.

Fig. 11. *Gomphus lineatifrons* new species. Dorsal view of right half of thorax to show color pattern; *hs* black humeral stripe; *md* dark mid-dorsal stripe; *1a* first pale antehumeral stripe. $\times 5.75$.

Fig. 12. *Gomphus dilatatus* Rambur. Diagram of the color pattern of the right half of thorax of Rambur’s type, by M. G. Severin. For labels of this specimen see explanation of fig. 10 above. Of his original diagram, here copied, M. Severin writes: “Ces dessins sont d’un brun plus ou moins pale. La partie rouge [here represented by the dotted area *h*] est un trou. À gauche du thorax il y a une couche de gomme laque qui cache le tout.” The lettering of the pattern is the writer’s [P.P.C.]: *hs* dark humeral stripe; *1lt* dark stripe on the obsolete first lateral thoracic suture; *2a* second pale antehumeral stripe.

Fig. 13. *Gomphus dilatatus* Rambur. Dorsal view of right half of thorax to show color pattern; lettering as in figs. 11 and 12. $\times 5.75$.

Figs. 1, 5, 8 and 13 of *Gomphus dilatatus* have been drawn from the female from Spring Creek, Decatur County, Georgia, June 7-23, 1911.

Figs. 2, 3, 4, 9 and 11 of *Gomphus lineatifrons* have been drawn from the type female from Weaver, Pennsylvania, June 17, 1917.

Plate XV

All the figures on this plate have been drawn from males only with the aid of the same optical apparatus as mentioned for Plate XIV, magnification 11.3.

Figs. 14, 15. *Gomphus dilatatus* Rambur. 14, Left profile view of hind end of abdomen; 15, Dorsal view of right superior abdominal appendage.

Fig. 16. *Gomphus lineatifrons* new species. Left profile view of hind end of abdomen.

Fig. 17. *G. dilatatus* Rambur. Latero-ventral view of the left side of the genitalia of abdominal segment two.

Fig. 18. *G. lineatifrons* new species. Dorsal view of right superior abdominal appendage.

Fig. 19. *G. vastus* Walsh. Left profile view of the anterior and posterior hamules of the second abdominal segment.

Fig. 20. *G. lineatifrons* new species. Latero-ventral view of the left side of the genitalia of abdominal segment two, penis not extended; *vp* vesicle of the penis.

Fig. 21. *G. dilatatus* Rambur. Penis and vesicle of the penis, extended.

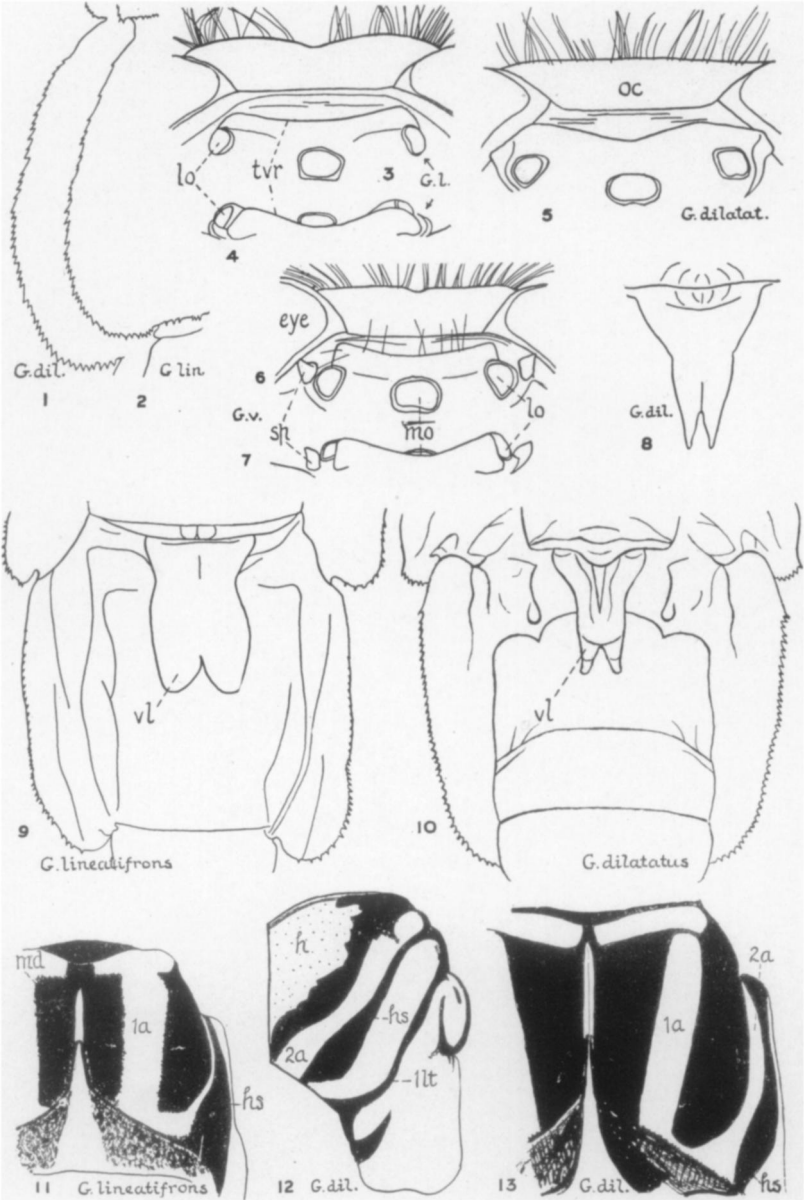
Fig. 22. *G. lineatifrons* new species. Penis and its vesicle extended.

Fig. 23. *G. vastus* Walsh. Penis and its vesicle extended; *tp* tooth of the penis.

Figs. 14, 15, 17 and 21 of *G. dilatatus* Rambur have been drawn from the male from Florida (probably Suwanee Springs) taken by Mrs. Slosson.

Figs. 16, 18, 20 and 22 of *Gomphus lineatifrons* new species, have been drawn from a male from Tippecanoe River, Indiana, June 23, 1901.

Figs. 19 and 23 of *Gomphus vastus* Walsh have been drawn from a male from Elkhart, Indiana, May 17, 1896, taken by R. J. Weith.



CALVERT—SPECIES OF GOMPHUS (ODONATA)

